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| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.           | CONFIRMATION NO.       |
|---|-------------|----------------------|-------------------------------|------------------------|
| 10/080,933  | 02/22/2002  | Jianzhong Zhang      | 59864.00665                   | 6502                   |
| 32294   | 7590        | 09/26/2007           |                               |                        |
| SQUIRE, SANDERS & DEMPSEY L.L.P.<br>14TH FLOOR<br>8000 TOWERS CRESCENT<br>TYSONS CORNER, VA 22182 |             |                      | EXAMINER<br>CORRIELUS, JEAN B |                        |
|   |             |                      | ART UNIT<br>2611              | PAPER NUMBER           |
|   |             |                      | MAIL DATE<br>09/26/2007       | DELIVERY MODE<br>PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

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|                              |                                      |                                     |  |
|------------------------------|--------------------------------------|-------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/080,933 | <b>Applicant(s)</b><br>ZHANG ET AL. |  |
|                              | <b>Examiner</b><br>Jean B. Corrielus | <b>Art Unit</b><br>2611             |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 August 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 21,23-34,36-38 and 40-42 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21,23-34,36-38 and 40-42 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

1. The 112, second paragraph, rejection has been withdrawn.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 21, 23-26, 28-30, 38 and 40-42 are rejected under 35 U.S.C. 102(e) as being anticipated by Zangi et al US patent No. 6,775,322 et al.

As per claim 21, Zangi et al teaches a receiving station (figs. 1 and 3) comprising a signal filter see col. 3, lines 47-50 inherently in communication with a signal receiving antenna (note fig. 1 is described by Zangi as see col. 3, lines 29-30, as a mobile station therefore it has to include an antenna); a signal estimator 122 in communication with the signal filter see col. 4, lines 57-60; circuit (124) corresponding to the claimed (signal optimizer) in communication with the signal filter since it receives its output from the estimator 122 to calculate the coefficients; circuits 101 and 108 considered as the claimed decision feedback estimator see col. 2, lines 12-14 in communication with circuit 124 (signal optimizer), Zangi et al further teaches that circuits 101 and 108 the

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decision feedback estimator includes a summing device 106 in communication with a prefilter 102 and a feedback filter 104 in communication with circuit 124 (signal optimizer) and the summing element 106, and a MLSE 108 in communication with the summing device 106 see col. 11, lines 9-12.

As per claim 23, Zangi et al teaches that the output of the decision device (MLSE) 108 is in communication with the feedback filter 104 and the input of the decision device (MLSE) 108 is in communication with an output of the summing element 106.

As per claim 24, Zangi et al teaches the feedback filter 104 comprises a first input in communication with circuit 124 (signal optimizer) and a second input in communication with an output of the MLSE 108.

As per claim 25, Zangi et al further teaches the summing element 106 receives inputs from prefilter 102 and the feedback filter 104 and sends a summed output to the MLSE device 108.

As per claim 26, the signal filter see col. 3, lines 47-50 is located in the forward path of the receiving station hence it has to be a feedforward filter.

As per claim 28, Zangi further teaches that the feedback filter 104 receives optimized signals from the signal optimizer 124 that are used to define filter characteristics of the feedback filter 104 see col. 4, lines 57-60.

As per claim 29, interconnection of the prefilter, the feedback filter, the MLSE and the summing element cooperatively operate to permit inherently concurrent interference and prefilter operation to be performed.

As per claim 30, the signal filter see col. 3, lines 47-50 and the signal estimator 122 is placed in the received chain of the receiving station see fig. 1.

As per claim 38, Zangi et al teaches a receiving station (fig. 1 and 3) comprising see col. 3, lines 47-50 inherently in communication with a signal receiving antenna (note fig. 1 is described by Zangi as see col. 3, lines 29-30, as a mobile station therefore it has to include an antenna); a signal estimator means 122 in communication with the signal filter means; means 124 corresponding to the claimed signal optimizer means in communication with the signal filter means; means 101 and 108 considered as the claimed "interference cancellation means" in communication with means 124 (signal optimizer means). Zangi further teaches that circuits 101 and 108 (decision feedback estimator) includes a summing device 106 in communication with a prefilter 102 and a feedback filter 104 in communication with circuit 124 (signal optimizer) and the summing element 106, and a MLSE 108 in communication with the summing device 106 see col. 11, lines 9-12.

As per claim 40 see claim 23.

As per claim 41 see claim 24.

As per claim 42, Zangi et al further teaches the summing element 106 receives inputs from prefilter 102 and the feedback filter 104 and sends a summed output to the MLSE device 108 and an output of the MLSE being an output from the receiving station see fig. 3.

***Claim Rejections - 35 USC § 103***

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4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zangi et al US patent No. 6,775,322 et al. in view of Taylor US Patent Application No. 2002/0197987.

As per claim 27, as applied to claim 25 above, Zangi et al teaches every feature of the claimed invention but does not explicitly teach the further limitation of a deinterleaver in communication with an output of the MLSE estimator and depuncture in communication with a deinterleaver and a channel decoder in communication with the deinterleaver. Taylor et al teaches a deinterleaver 58 in communication with an output of the MLSE estimator(i.e. output of demodulator/equalizer 56) and depuncture 62 in communication with a deinterleaver 58 and a channel decoder 64 in communication with the deinterleaver 58. It would have been obvious to one skill in the art to incorporate such a teaching in Zangi et al in order to recover the originally transmitted signal.

6. Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zangi et al US patent No. 6,775,322 in view of Malkemes et al US Patent Application publication S/n US2002/0106040 A1.

As per claim 31, as applied to claim 30 above, Zangi et al teaches every feature of the claimed invention but does not explicitly teach that the receiving station comprises a plurality of receive chains that corresponds to a plurality of signal receiving antennas configured to receive and transmit a plurality of signal vector to the plurality of receive chains. Malkemes et al teaches the receiving station (fig. 1) comprises a plurality of receive chains see fig. 1) that corresponds to a plurality of signal receiving antennas 102 configured to receive and transmit a plurality of signal vector to the plurality of receive chains. Given that fact, it would have been obvious to one skill in the art to incorporate such a teaching in Zangi et al in order to improve signal detection since the system would have been able to be configured to receive multiple copies so that existence of signal error can be easily determined.

As per claim 32, see claim 31.

As per claim 33, Zangi et al further teaches the feedforward filter 102 filters the data vector and transmitting a feedforward output to a summing element 106; receiving an output of the summing element in a MLSE device 108 and generating an output of that is transmitted to an input of the feedback filter 104 and subsequent component and filtering the output received from the MSLE device in the feedback filter 104 and transmitting a filtered signal to the summing element 106.

As per claim 34 the interference cancellation and prefiltering includes filtering the data vector in prefilter 102 and processing the data vector with a DFSE 108.

As per claim 36, Zangi further teaches the received chain comprises a receiving filter see col. 3, lines 47-50 inherently in communication with a signal receiving antenna

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(note fig. 1 is described by Zangi as see col. 3, lines 29-30, as a mobile station therefore it has to include an antenna); a channel estimator 122 in communication with the receiving filter; the channel estimator 122 in communication with circuit 124 corresponding to the claimed signal optimizer configured to optimized feedforward and feedback filter parameters see col. 5, lines 1-27.

7. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zangi et al US patent No. 6,775,322 in view of Malkemes et al US Patent Application publication S/N US2002/0106040 A1 and further in view of Taylor US Patent Application No. 2002/0197987.

As per claim 27, as applied to claim 25 above, Zangi et al and Taylor teaches every feature of the claimed invention but do not explicitly teach the further limitation of a deinterleaver in communication with an output of the MLSE estimator and depuncture in communication with a deinterleaver and a channel decoder in communication with the deinterleaver. Taylor et al teaches a deinterleaver 58 in communication with an output of the MLSE estimator (i.e. output of demodulator/equalizer 56) and depuncture 62 in communication with a deinterleaver 58 and a channel decoder 64 in communication with the deinterleaver 58. It would have been obvious to one skill in the art to incorporate such a teaching in Zangi et al and Malkemes in order to recover the originally transmitted signal.

### ***Conclusion***



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8. Applicant's arguments filed 8/29/07 have been fully considered but they are not persuasive. Applicant alleged that " the Examiner's interpretation is incorrect in that the decision unit 108 of Zangi cannot be interpreted as simultaneously being two different features of Applicants' claimed invention". However, it is noted that the rejection did not read "decision device 108" on two different feature of the applicant's claimed invention. Decision device 108, as noted in the above rejection, is said to be disclosed by Zangi as **part of DFSE circuit** (101 and 108) see col. 3, lines 62-64 and at col. 11, lines 8-12. Applicant further argued the Examiner incorrectly states that unit 108 is equivalent to both Applicants' DFSE and MLSE because "the cited features of Zangi are not structurally and functionally equivalent to Applicants' claimed features", as Zangi fails to disclose at least a decision feedback sequence estimator in communication with the signal optimizer, wherein the decision feedback sequence estimator comprises a prefilter, a summing element in communication with the prefilter, a feedback filter in communication with the signal optimizer and the summing element, and a maximum likelihood sequence estimator in communication with the summing element, as recited in independent claim 21 of the present invention. As noted above, Zangi only discloses MLSE 108 as part of DFSE circuit (101 and 108). In addition, no structural and functional difference can be seen between applicants claimed invention as recited in claim 21 and Zangi. Because *Zangi clearly teaches a DFSE circuit (101 and 108) see col. 2, lines 12-14 in communication with circuit 124 (signal optimizer), Zangi et al further teaches that circuits 101 and 108 (decision feedback estimator) includes a summing device 106 in communication with a prefilter 102 and a feedback filter 104 in*

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*communication with circuit 124 (signal optimizer) and the summing element 106, and a MLSE 108 in communication with the summing device 106 see col. 11, lines 9-12.*

It is the applicant's position that signal estimator 122 as disclosed by Zangi is in communication with a sampler as oppose to a "signal filter". Examiner disagrees. Note that the signal is first process by a receive filter before being provided to the sampler see col. 3, lines 45-47. Since the signal estimator is in communication with the sampler, it is also in communication with the signal filter feeds the signal estimator 122 via the sampler circuit. Applicant further argues that "the Examiner's allegation that "signal optimizer 124" is in communication with the "signal filter" since it receives output from the "estimator 122 to calculate the coefficients" is insupportable because element 124 of Zangi is actually an adaptive algorithm that cooperates with the channel estimator 122 in the processor 120". However, it is noted that such comment is consistent with Zangi that clearly teach estimator 122 receives a signal from a "receive filter" through the sampler circuit see col. 3, lines 46-51, col. 4, line 57-col. 5, line 25. It is also asserted that "in view of the description provided in Zangi and Taylor, Applicants would point out to the Examiner that there is no motivation or suggestion to combine Taylor and Zangi. While the presently claimed invention is related to a Multiple-Input, Multiple-Output (MIMO) communication system, neither Taylor nor Zangi appears to be related to a MIMO communication system". However, it is noted that proper motivation is provided as to why one skill in the art would have combined Zangi and Taylor. It is the applicant's position that the "demodulator" of Taylor is not equivalent to the MLSE circuit as claimed. However it is noted that both the demodulator of Taylor and the MLSE circuit of

applicant claimed invention function to provide an equalized output to the deinterleaver circuit. Hence, the “demodulator” disclosed by Taylor is functionally equivalent to the claimed MLSE. In addition, for the sake of argument, note at paragraph 0016, Taylor teaches that demodulator 56 includes an equalizer and as shown in the primary reference, equalizer is known to include decision device (MLSE circuit). Hence the demodulator of Taylor is functionally equivalent to the claimed MLSE circuit. It is alleged that Malkemes does not disclose a DFSE circuit having the configuration as recited in claim 21. However, it is noted that Zangi teaches the feature of the DFSE circuit as recited in the claim(s). It is further alleged that the combination of Zangi and Malkemes is improper without motivation to combine the references. However, it is noted that proper motivation is provided in the office action to combine the references.

### ***Conclusion***

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jean B. Corrielus whose telephone number is 571-272-3020. The examiner can normally be reached on Monday-Thursday from 9:30-3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Jean B Corrielus  
Primary Examiner  
Art Unit 2611

9-21-07